

## Roller coaster headache and subdural hematoma

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NEUROLOGY 2000;54:264

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*Riding* giant roller coasters may increase the risk of subdural hematomas. There have been three recent case reports on the topic.<sup>1-3</sup> A 26-year-old man developed bilateral subdural hematomas after *riding* a double-loop, corkscrew-type roller coaster.<sup>1</sup> A 64-year-old hypertensive man had headaches after his first roller-coaster *ride* and developed a left-sided chronic subdural hematoma after 11 more *rides*. These two cases had successful surgical evacuation.<sup>1-2</sup> A fatal outcome was reported in a 73-year-old man being treated with warfarin.<sup>3</sup> This patient developed a left-sided subdural hematoma and a parenchymal temporal hematoma 5 days after a roller-coaster *ride*. Despite surgery, he died 13 days later.

We report the new case of a previously healthy woman who developed headaches and bilateral chronic subdural hematomas after a series of roller-coaster *rides*.

**Case report.** A 24-year-old Japanese woman visited our hospital with a headache of 4 days duration. She was otherwise in good health and did not previously have headaches. She drank alcohol only on social occasions and did not smoke. She visited *amusement* parks three or four times per year. The headache developed as the woman was on her way home from Fujiyama Highland Park, Yamanashi Pref., Japan, where she had ridden three different roller coasters, each twice. One of these, the Fujiyama, is the world's highest roller coaster at 259 feet. It has a drop of 230 feet at an angle of 65° and has the world's fastest speed of 81 mph (<http://www.rollercoaster.com/statistics> accessed March 1, 1999). There was no direct trauma to her head or loss of consciousness during the *rides*. In the first interview, she did not mention roller-coaster *rides* but stressed how hard her visual display terminal (VDT) work had been over the past 2 months.

The woman's headache was constant, mainly suboccipital, worse in the evening, and partially relieved by rest. Upon examination, her temperature was 36.8°C, blood pressure 84/50 mm Hg, and heart rate 72 beats per minute. She was alert, cooperative, and well oriented. There was no evidence of head trauma, and her tympanic membranes were normal. Her neck was supple, but her shoulders were stiff and tender. Neurologic examination results were normal. Her pupils were equal and reactive to light, and there was no papilledema or retinal hemorrhages. Routine laboratory tests for blood and urine all were normal. Tension-type headache was initially diagnosed, and muscle relaxants were prescribed for 4 weeks with some benefit; the headaches fluctuated but were unrelieved.

Two months later, MRI of the head ruled out an organic problem and showed bilateral subdural hematomas with neomembranes (figure). At this time, coagulation tests gave a platelet count of 189,000/mm<sup>3</sup>, a bleeding time of 4 minutes, a whole-blood clotting time of 6 minutes, a prothrombin time of 12.2 sec, an activated partial thromboplastin time of 40 seconds, and an AT-III of 111%. Fibrinogen and fibrin degradation product (FDP) serum levels were normal. We evacuated both hematomas, which were encapsulated by outer and inner neomembranes. Her headache resolved postoperatively, and 8 weeks after surgery she was symptom free.



Figure. T1-weighted MRI of the head showing bilateral subdural hematomas with neomembranes.

**Discussion.** Chronic subdural hematoma occurs mainly in older people with a 3 to 1 male predominance and is extremely rare in young women.<sup>4,5</sup> A mild, but direct, head injury is the cause of most chronic subdural hematomas<sup>4</sup>; a history of head trauma is absent in 25% to 50% of such cases.<sup>5</sup> Rare precipitating factors include a fall to the sitting position, severe sneezing or coughing, strain from heavy lifting,<sup>4</sup> and whiplash injury.<sup>6</sup> Hypertension, diabetes mellitus, anticoagulation therapy, alcoholism, and epilepsy may be underlying causes in addition to such rare factors as brain tumors, infectious diseases, carcinomatosis, and coagulopathies.<sup>7</sup> All of these diseases and precipitating factors were excluded by our patient's history, laboratory data, surgical findings, and postoperative course. In contrast, two of the three reported patients with subdural hematomas after roller-coaster *rides* were older than 60 years and had accompanying hypertension or anticoagulation.

Our patient's subdural hematomas and resulting headaches also occurred after *riding* roller coasters, one of which is the world's highest and fastest. This type of *ride* induces up-and-down, to-and-fro, and rotatory acceleration, which produces tensile and shearing stresses.<sup>2</sup> Our findings support the hypothesis by Fernandes and Daya<sup>1</sup> that in the absence of any other predisposing factor, the acceleration forces associated with roller-coaster *rides* cause the tearing of bridging veins resulting in subdural hemorrhage. In turn, neomembrane formation leads to chronic subdural hematoma.

*Riding* giant roller coasters can cause chronic subdural hematoma even in a previously healthy woman. Builders and designers, managers of *amusement* parks, and potential passengers on giant roller coasters need to be aware of this risk.

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Received April 5, 1999.

Accepted in final form August 9, 1999.

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NEUROLOGY 54 January (1 of 2) 2000

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